

The Effect of Providing On-site Technical Assistance for Toxics Use Reduction: A Program Evaluation Utilizing Toxics Use Reduction Act Data

Executive Summary

Summary

In 2005, the Massachusetts Office of Technical Assistance (OTA) conducted a study of Toxics Use Reduction Act (TURA) data to assess whether its technical assistance services have been effective in helping companies reduce their use of toxics. Approximately half the companies OTA visited are covered by TURA and publicly report their chemical input or use, output or chemical waste, and a production index. OTA developed measures using this data to assess its historical effectiveness. This summary explains what the measures are and what they show concerning OTA's past performance.

OTA Services

The Massachusetts Toxics Use Reduction Act (TURA) established OTA to provide assistance to companies that may need help finding ways to reduce their use of chemicals. OTA engineers and specialists are available to visit companies and view production operations and other information, and make specific suggestions and observations that will inform toxics users of their options.

No company is required to implement OTA's recommendations. Because of the voluntary nature of the program, any performance improvements are the accomplishment of the visited company. OTA can only at best share credit for any toxics use reduction found to have occurred. Since its inception OTA has visited more than 1,300 companies.

Measurement Methodology

TURA data can be used to track trends in toxics use relative to production and waste byproduct per pound of chemical use input. These are uniquely precise measurements of a company's ability to accomplish the form of pollution prevention known as toxics use reduction. Only the state of New Jersey has similar data. Four basic measures were developed:

1. Average changes in pounds used relative to production.
2. The percentage reductions achieved, compared to what was expected.
3. The amount of waste (byproduct) per pound of chemical input.
4. The ratio of companies who reduced toxics use (advancers) to those who increased toxics use (decliners).

The study examined whether companies visited through OTA's technical assistance program had greater reductions in toxics use after being visited, than before. The changes by visited companies were also compared to companies not visited by OTA.

Detailed Description of the Measures Used

Average Changes in Pounds Used Relative to Production. Changes in production can cause increases and reductions in chemical use and/or waste. To see if a company reduced its chemical use beyond what production changes are responsible for, it is necessary to adjust for production. OTA did this by multiplying the amount of toxics use in the first year of reporting by the production ratios in subsequent years. This operation yielded an “expected” amount of toxics use for each chemical for each year.

The amount of expected chemical use was then compared to the actual toxics use. If the expected use was less than the actual use, then the company had increased its toxics use relative to production changes. If the expected use was more than the actual use, the company had reduced its toxics use relative to production.

Percentage Reductions of Use. The amount of chemicals used differs from company to company, and an average change, measured in pounds, does not accurately gauge the performance of the group as a whole. To compare companies that use millions of pounds with companies that use thousands, a percentage reduction is necessary. To assess the performance trends of groups, OTA divided the amounts reduced by each company by the amounts expected of each company. This produced a percentage reduction from expected toxics use, normalized according to amount of chemical use.

Advancers/Decliners. Using the production-adjusted pounds measure, the ratio of advancers to decliners was tracked. (An advancer is a company that had less toxic use relative to production, in subsequent years, a decliner had more toxics use). If the visited group had a higher advancer/decliner ratio than the not-visited groups over the same time period, such a finding would support an inference that the OTA visit made a difference.

Byproduct-Use Ratio. Complementing measures of whether toxics input increased or decreased is a measure of how much waste resulted from each pound of toxic chemical used. (Byproduct means all types of waste – nonproduct output - from chemical use input). Like the percentage reductions in use, this measure is independent of the size (amount) of use.

Results of the Program Evaluation

OTA divided TURA filers into three groups: Companies visited in a particular year, companies never visited, and companies that were not visited prior to and including the year examined.

Percentage of Reductions

Before OTA visited, on average, companies were not reducing toxics use. The average percent reductions for all years **before the visit was -2.49%**. The average reduction for all years **after being visited was 6.95%**. (Figure 1). The ANOVA (Analysis of Variance) statistical test was applied to the dataset and the difference was found to be statistically significant to a high degree of confidence.

How much toxics use reduction is that? We employed the assumption that if companies had not been visited, they would have performed at the same rate as those who would be visited later. We took the 9.4 percent difference between the average percent reductions by the visited and not yet visited companies, and applied that to the total annual pounds of use that visited companies were expected to have, after adjusting for production, during a six-year period for which there was sufficient information to make these calculations. This produced a rough estimate of **63 million pounds of toxics use** reduced in association with the visits by OTA, during the time period 1995 - 2001.¹

Pounds Reduced:

Companies visited reduced an average of 5,114 pounds more, the year of the visit, than the year before being visited. In the same time frame, companies never visited reduced only 1,513 pounds on average, and companies later visited later by OTA reduced only 1,980. (Comparing visited companies with those not yet visited eliminates the bias of self-selection that occurs when a company asks OTA for assistance).

In the year following a visit, these same companies maintained a similar level of reduction compared to the year before being visited: an average of 5,277 pounds. In the same time frame, companies never visited only reduced their usage by 1,809 pounds, and companies later visited only reduced 915 pounds. **(Figure 2). Companies visited by OTA reduced 2.5 – 5.7 times more pounds of toxics than those never visited or later visited.**

Ratio of Advancers to Decliners:

Averaging all years, 63.8% of companies visited by OTA advanced the year of the visit, and 66.5% the year after. Companies never visited had a ratio of 55.2% and 55.3% advancers to decliners, in the same time frame. Companies later visited later had 56.9% and 55.8% advancers/decliners in those same years **(Figure 3). More visited companies showed improvements than those not visited.**

Byproduct/Use Ratios:

Companies visited showed a byproduct/use ratio of 10.3% (10.3 pounds of every 100 pounds). Companies never visited showed a ratio of 20.9%. Companies later visited showed a ratio of 22.2%. **Companies not visited had about twice as much waste per pound of toxic chemical used, as those visited.** (Figure 4).

How much toxics waste reduction is that? Applying the difference in ratios to the original amounts used by visited companies produces an estimate that **47 million** pounds of toxic waste was reduced from what would have otherwise been generated. ($396,028,146 \text{ times } 10.3\% = 40,790,899$; $\text{times } 22.2\% = 87,918,248$).

¹ OTA has visited many more companies, that do not report under TURA. In addition, this analysis does not calculate the reductions by hundreds of companies visited by OTA before 1994. An independent study of OTA's effectiveness by Dr. Robert Kaufmann of the Boston University Center for Energy and Environmental Studies, (not as yet published), using econometric modeling, has found that visits are associated with a 38% reduction, examining one quarter of the chemicals with which OTA has worked.

Conclusion

The methodology of using all four measurements has produced a picture of program effectiveness confirmed by the application of completely different methods – including an unpublished econometric analysis by Boston University that also found strong indications of program effectiveness. An in-house study of those who dropped out of the program also supports the thesis of program effectiveness. Two very different methods of estimating how much has been reduced have produced similar results: our in-house methods, and Boston University’s study, corroborating the findings of a statistically significant association of substantial reductions with OTA visits. The estimates do not take account of several years of visits during which reductions were also made, but not measured in this study, and reductions by companies that do not report under TURA.

The reductions were the accomplishments of the companies that implemented them, along with the vendors and consultants that were hired. OTA’s role was to help each company to understand its options, and to facilitate the process of change. That visited companies performed better after being visited, and had more progress than those not visited, shows that OTA assistance was helpful, but credit belongs to the companies themselves.

Annual Tracking of OTA Progress

OTA will use the four measures in annual tracking to understand the effect it is having on visited companies, in order to improve its service delivery. The analysis will help OTA to better understand where it is and is not having success and where it needs to devote more resources.

Valuation of Pollution Prevention

OTA is interested in communicating with interested parties on methods of calculating the economic benefits of the identified reductions in toxics use.

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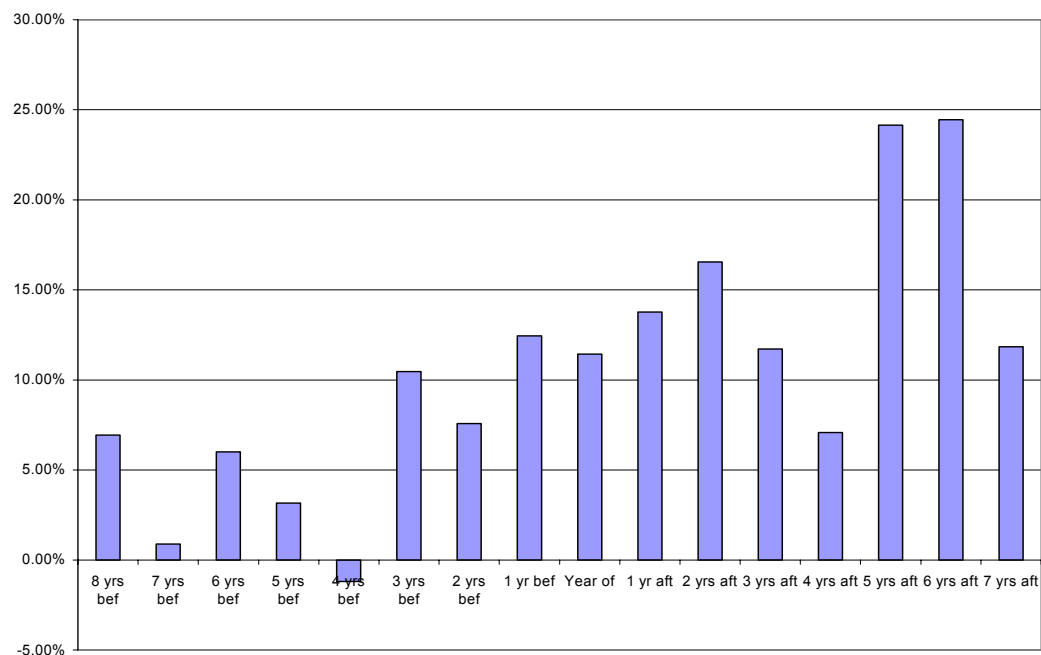


Figure 1. The average reductions in toxic use, as a percentage of what was expected after adjusting for production, for all visited companies, grouped in categories of number of years before and after the visit.

	Year of Visit	Year After		Year of Visit	Year After
Visited in 1995	11.50	11.30	Visited in 1995	2,929	4,549
Never Visited	4.60	7.70	Never Visited	2,412	3,121
Not Yet Visited in 95	4.00	3.20	Not Yet Visited in 1995	1,028	545
Visited in 1996	13.20	6.04	Visited in 1996	4,459	2,278
Never Visited	5.50	6.60	Never Visited	2,093	2,808
Not Yet Visited in 96	10.60	6.90	Not Yet Visited in 1996	3,680	2,483
Visited in 1997	12.50	21.60	Visited in 1997	5,304	4,979
Never Visited	3.30	6.60	Never Visited	894	1,696
Not Yet Visited in 97	2.00	5.10	Not Yet Visited in 1997	1,095	1,418
Visited in 1998	34.60	7.40	Visited in 1998	5,255	4,805
Never Visited	5.80	4.70	Never Visited	983	789
Not Yet Visited in 98	5.40	9.40	Not Yet Visited in 1998	1,209	2,811
Visited in 1999	37.66	27.87	Visited in 1999	5,793	8,108
Never Visited	4.20	2.80	Never Visited	1,199	1,125
Not Yet Visited in 99	14.30	7.40	Not Yet Visited in 1999	4,150	1,787
Visited in 2000	13.60	16.20	Visited in 2000	6,945	6,943
Never Visited	2.20	4.20	Never Visited	1,496	1,315
Not Yet Visited in 2000	0.70	-5.90	Not Yet Visited in 2000	717	-3,554
average, all years, visited	20.51	15.07	average, all years, visited	5,114	5,277
average, all years, never	4.27	5.43	average, all years, never	1,513	1,809
average, all years, not yet	6.17	4.35	average, all years, not yet	1,980	915

Figure 2. The change in toxics use reductions by visited companies, comparing the year of the visit, and the year after being visited, with the year before being visited by OTA. The differences between the years in terms of percentages are on the left, the differences in pounds are on the right. The average reductions by companies not visited - during the same time period - is presented for comparison and the averages for all years are presented at the bottom of the graph.

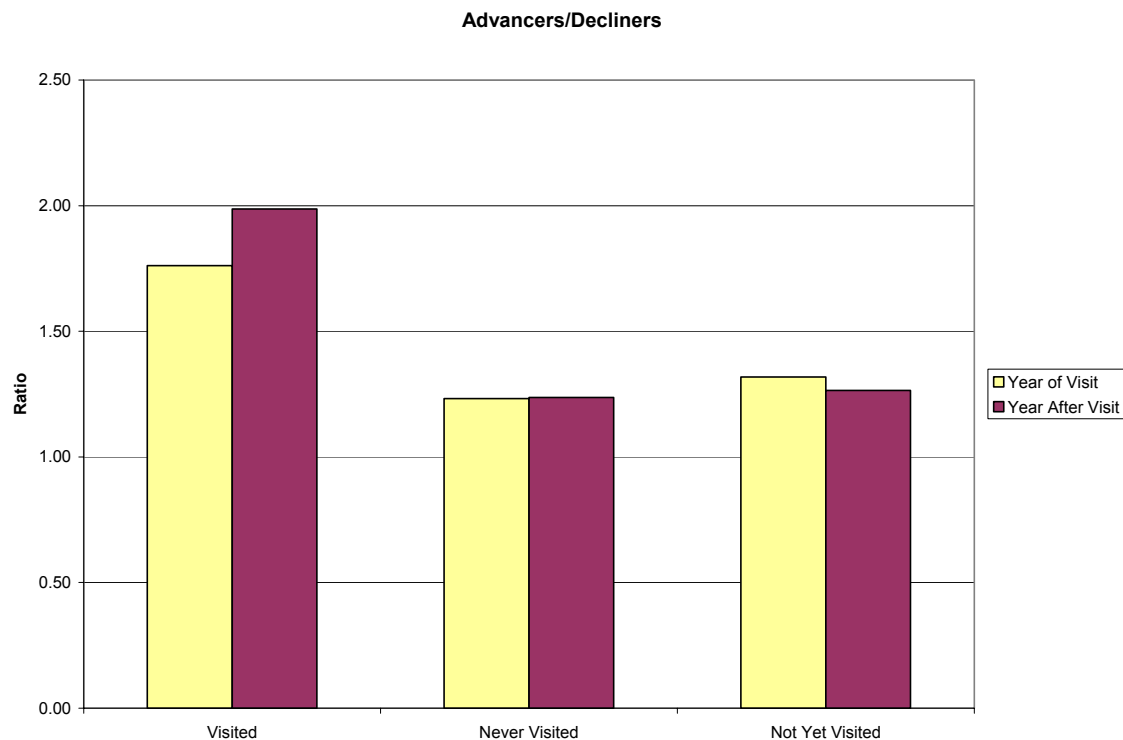


Figure 3. The ratio, in each group of those who had reductions (“advancers”) to those who increased toxics use (“decliners”), using the production-adjusted pounds of reduction measure. The taller the column, the more advancers there were in the group.

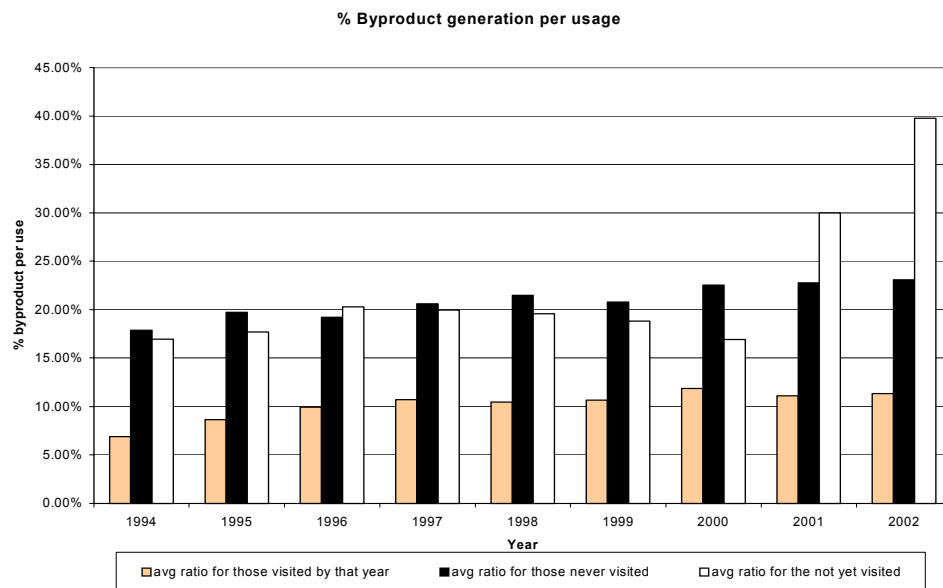


Figure 4. The average percentage of byproduct (nonproduct output, or waste chemical) per pound of chemical used, for each group in each year. Visited companies – light color – consistently generated the lowest amount.